

## **PART II**

# **THE HIDDEN COSTS OF BEEF IN THE UNITED STATES**

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## INTRODUCTION

**M**eat has long been recognized as an important part of the American diet. We are a nation of meat lovers, leading the world in overall meat consumption and ranking third in terms of beef consumption. The economic value of the meat industry is staggering. In 1985, consumers spent \$35.7 billion for fresh meat and poultry alone. Another \$14.8 billion was spent on processed, frozen, and canned meats.<sup>1</sup> Yet Americans spend a relatively smaller share of their income on food—approximately 10 percent—than people living in other countries. By way of comparison, Germans spend 20 percent of their income for food expenditures; in the Philippines and other Third World countries, nearly 50 percent of the people's income may be spent on food.<sup>2</sup> It would seem that Americans are indeed fortunate to be able to obtain meat and other foods at so little cost.

Beef itself has consistently accounted for the largest percentage and volume of meat consumed by Americans. The average per capita consumption of beef in 1987 was 73.4 pounds, for which consumers spent \$21 billion. Most Americans believe that the price of beef, which, in 1987, averaged \$2.45 per pound,<sup>3</sup> is relatively cheap, and that this protein source is both highly abundant and richly nutritious and healthful. These beliefs are constantly being reinforced by the National Livestock and Meat Board's advertising campaigns, which spent \$27 million in 1987 alone to promote beef consumption.

Is the retail supermarket price of beef the real price? Is beef really as cheap and healthy for us as the beef industry proclaims? We believe that there is much evidence to the contrary. Beef is not a "health food," and the hidden costs of beef production and consumption drive the true costs considerably higher than most consumers realize. In this report, we will examine three major areas that are part of the hidden costs of beef: health costs to the consumer, environmental costs to our natural resources, and welfare costs to the animals themselves.

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## A HISTORY OF THE MEAT INDUSTRY

**A** brief historical perspective may help us to understand our roots in a meat-based culture. It was in the Fertile Crescent of the Middle East, in ancient times, that people made a decisive, historic leap from food gathering to food producing and became farmers and herders. This evolutionary change

created the economic preconditions for urban life. For the first time, many of the foods that are commonly consumed today—dairy products, eggs, cereals, breads, and other foods—were made available and began to replace the wider variety of natural, unprocessed foods that had formerly yielded a high ratio of nutrients to calories. While the ruling classes quickly learned to enjoy a rich diet similar to our own today, the rest of the population in cultures such as Egypt subsisted quite differently on a diet consisting mainly of bread and beer.<sup>4</sup> Many experts agree that, with the advent of agriculture and the associated rise in population, there was a clearly correlated decline in the health of most agricultural communities.

For a majority of mankind today, notably the peoples of the Third World countries of Africa, Asia, and Latin America, cereal grains are still relied upon as the chief dietary staple, comprising 60 to 90 percent of their daily caloric intake. Without question, this does not represent a balanced diet, and many people in these countries are malnourished or undernourished. In the more economically developed countries, however, marked nutritional changes have emerged.<sup>5</sup> In conjunction with industrialization, urbanization, and an increase in per capita income, richer diets with greater quantities of high lipid foods of animal origin (fattened meats, eggs, and dairy products) have been increasingly consumed. These cultural changes have been repeatedly observed to occur as economic conditions improve. With these dietary changes comes malnutrition of a different sort—literally “bad” nutrition caused by an overconsumption of animal fats and processed foods.

Here in contemporary America, where only 4 percent of the population is estimated to be strictly vegetarian, the vast majority of the population consumes meat regularly. Among the meats that Americans eat, beef enjoys a special status. Be it partly unconscious or not, beef somehow symbolizes the “good life”—economic attainment, health, and virility. When the beef industry undertakes a new campaign to promote the consumption of beef, it seeks to stamp these perceptions ever more firmly in the minds of consumers, as in its recent “Real People Eat Beef” marketing blitz. While the more affluent may eat steak and the less affluent may have hamburger, beef consumption continues regardless of economic bracket. Between 1960 and 1987, beef consumption rose from 64.2 pounds to 73.4 pounds annually per capita and is expected to hold steady, according to U.S. Department of Agriculture (USDA) figures.<sup>6</sup>

Although most Americans have never seen a cattle ranch or the western ranges where many cattle are grazed, the image of the handsome lone cowboy and his horse protecting

their animals from Indians and coyotes persists, coloring our imagination and enhancing the appeal of this meat. But do our simplistic and romanticized notions of the beef industry mesh with the realities of this segment of the meat industry today?

It will come as a surprise to many that the beef-cattle industry is the largest single agricultural enterprise in the United States. Beef cattle account for approximately 20 percent of the cash receipts for the entire U.S. farm marketing sector. According to the National Cattlemen’s Association, the 1986 sales of cattle and calves totaled \$28.9 billion. Figures for 1987 show that there were 102 million cattle and calves being raised on U.S. ranches and farms and feedlots. Principal cattle feeding states, which have 93 percent of the nation’s feedlots, are: Iowa, Nebraska, Kansas, Texas, Colorado, California, and Arizona.

Clearly, the modern beef industry is big business, and capital intensive livestock rearing practices in the past twenty to thirty years have markedly changed to reflect the modern nature of this business. No longer are beef cattle allowed to mature slowly, as nature would have it, over a three- or four-year period. Such animals used to be taken directly from the range or pasture to the slaughterhouse. As they had been permitted to freely range and have exercise, their bodies were lean and healthy, and the meat fat from these animals was yellow, soft, and largely unsaturated. Now the prevalent philosophy is that quality and nutritional value are of lesser importance than the intensive search for economy, speed, and bigness. The fertility of pastures is often manipulated by repeated applications of synthetic fertilizers, herbicides, and insecticides, all of which affect the livestock that graze these pastures and the people who subsequently eat their meat.

Various means are used today to fatten beef animals quickly and cheaply, get them to market earlier, and sell them at maximum profit. These practices often compromise the health of the animals and the safety of the food. The feedlot business evolved as a means of utilizing inexpensively produced surplus grains and food-and-beverage industry products. In the feedlot environment, which is far from natural, the basic physiology of the animal has been altered.<sup>7</sup> The majority of young beef animals are transported to feedlots after being weaned, when they weigh approximately six to eight hundred pounds. There they are “finished” on high-energy grains and fattened feedstuffs for five to six months until their weight reaches approximately one thousand to eleven hundred pounds, when they are slaughtered. Drugs that change the metabolism and increase muscle and fat artificially may also be given, the

goal being to produce choice cuts of beef laced with the marbling of fat that has such high appeal for meat graders and the uninformed consumer. This fat is also hard, white, and almost totally saturated.

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## HIDDEN HEALTH COSTS

Let's look now at the hidden health costs that the consumer faces from a diet high in beef consumption. The developed nations of the world have been afflicted in recent decades with a host of diseases that are largely absent in underdeveloped countries and in societies that are either vegetarian or enjoy a more natural diet. Here we speak not of infectious diseases, but rather of degenerative diseases, such as atherosclerosis, cancer, and osteoporosis, to name a representative few. The excessive consumption of fat and protein and the lack of fiber are all factors linked to these degenerative diseases.<sup>8</sup> The nutritional content of meat is composed almost exclusively of fat and protein, with iron, zinc, phosphorus, and B vitamins present as trace minerals and vitamins. It contains virtually no fiber and no carbohydrates, either simple or complex.

During the last fifteen to twenty years, more and more medical authorities have come to the same conclusion: diets high in saturated fat and cholesterol raise the level of cholesterol in the blood, produce atherosclerosis, and lead directly to heart disease and strokes.<sup>9</sup> Diets low in saturated fat and cholesterol lower the level of cholesterol in the blood, decrease atherosclerosis, and lower the likelihood of heart disease and strokes. As far back as World War I, scientific data supporting this became available.

During 1917 and 1918, the Allied blockade cut Denmark off from all food imports. The Danish government was forced to develop for the country a rationing program that virtually eliminated meat consumption during that time. Surprisingly, it was found that the overall disease mortality dropped more than 34 percent during the time when food restrictions were most severe.<sup>10</sup> Similarly, during World War II, when Norway was occupied by the Germans, meat consumption was drastically reduced and the death rate from circulatory disease dropped dramatically. After the war, the Norwegians returned to their former diet and death rates rose accordingly.<sup>11</sup> In other countries with similar wartime meat shortages, the results were the same. Long-term studies, such as the Framingham Study, which scrutinized cardiovascular disease factors in 5,209 subjects over a thirty-six-year period, have helped to delineate

this connection between cholesterol and a high-fat diet in causing heart disease.<sup>12</sup>

While some scientists now theorize that it is an excess protein intake coupled with a vitamin B<sub>6</sub> deficiency that is a principal cause of cardiovascular disease, beef and pork are strongly implicated as the primary dietary factors, regardless of whether one ascribes to an excess-fat or excess-protein theory. A study that reviewed U.S. food trends during the past seventy years reveals that Americans still obtain their primary fat sources from animals and that beef alone accounts for almost as much protein in the diet as all grain products combined.<sup>13</sup> Americans also consume 2 to 2.5 times the recommended amount of protein per day (102 g. vs. 40–45 g.) and more than 10 percent more fat (40 percent vs. less than 30 percent) than is recommended.<sup>14</sup> The economic cost of our unbalanced diet and the cardiovascular disease that it causes is very high—in 1977 alone, more than \$37 billion in direct costs plus morbidity and mortality costs were attributed to atherosclerosis and the attendant conditions of coronary heart disease and strokes.<sup>15</sup> Nearly 1 million adults die each year of cardiovascular disease in the United States.

Cancer is rivaled only by heart disease as a major cause of death in Western countries. In 1987, 1323 people a day died of cancer, about one every sixty-five seconds.<sup>16</sup> Approximately 74 million Americans now living will eventually get cancer. The most common cancers—of the lungs, colon, breast, prostate, and uterus—together account for most cancer deaths. But, with the exception of lung cancer, whose incidence continues to increase (and stomach cancer rates, which are declining), the death rate for most cancers has remained the same for the past thirty to forty years. Since treatment for cancer is so invasive, painful, and, in many cases, futile, prevention has to be the key. The Diet, Nutrition, and Cancer Committee of the National Research Council said in its summary report that "...it has become clear that most cancers have external causes and, in principle, should therefore be preventable."<sup>17</sup>

How can cancer be prevented? A prestigious journal concludes that "at present, we have overwhelming evidence...[that] none of the risk factors for cancer is...more significant than diet and nutrition."<sup>18</sup> And, to quote one more of the experts, Dr. Gio Gori, the director of the Diet, Nutrition, and Cancer Program within the National Cancer Institute, testified at a senate hearing that "until recently, many eyebrows would have been raised by the suggestions that an imbalance of normal dietary components could lead to cancer and cardiovascular disease.... Today, the accumulation of...evidence...makes the

notion not only possible but certain...[that the] dietary factors responsible [are] principally meat and fat intake.”<sup>19</sup>

With the exception of lung cancer, whose cause is principally smoking, colon cancer is the most common cancer in the United States, with 145,000 new cases anticipated in 1987.<sup>20</sup> Strong correlations between colon cancer mortality and the consumption of both fat and animal protein exist. High-fat diets increase bile acid secretion, which promotes tumor formation. Protein intake is also highly correlated with colon cancer. Although the mechanism of action is not clear, the conjecture is that carcinogenic substances are produced by the cooking and digestion of the meat protein. Another critical factor in the development of colon cancer is lack of fiber. This is probably because the fiber protects the colon from carcinogens in the digestive system.

Breast cancer is the most common form of fatal cancer in women in the United States and many other Western countries and correlates highly with meat consumption rates in these countries, as compared to other parts of the world where less meat is eaten. One hundred and thirty thousand new cases of breast cancer were predicted during 1987.<sup>21</sup> Like colon cancer, breast cancer is highly correlated with a high-fat diet. The leading theory is that fat stimulates the release of prolactin, a hormone which regulates fat metabolism and lactation in women.

Prostate cancer is the third most common form of fatal cancer in men in the United States. Like colon and breast cancer, it is highly correlated with total fat consumption. Autopsy studies have shown a high incidence of prostate cancer in areas where fat consumption and breast cancer are also high. Prostate cancer affects up to one-fourth of all men in Western countries by the time they reach old age. In the United States, 96,000 new cases were expected during 1987.<sup>22</sup>

The effect of diet on cancer deserves more attention than most people have been giving it. The most prevalent cancers in the United States are closely related to a diet having lots of fat and protein and very little fiber. Beef (and other meats) consist exclusively of fat and protein and contain virtually no fiber. The facts should speak for themselves.

Cancer in total accounts for 10 percent of the total cost of disease in the United States each year.<sup>23</sup> In economic terms, typical cancer patients will spend more than \$25,000 to try to treat their disease. A study by the National Center for Health Statistics computed overall medical costs for cancer at \$71.6 billion for 1985, which included \$21.8 billion for direct costs, \$8.6 billion for morbidity costs (the cost of lost productivity),

and \$41.2 billion for mortality costs. The percentage of these costs attributable to colon, breast, and prostate cancer totals \$29 billion.

Osteoporosis is another degenerative disease, like atherosclerosis and cancer, and is similarly linked to excess meat intake. It affects about 24 million people in the United States (nine out of ten are women), according to the National Institutes of Health's (NIH) National Institute on Aging.<sup>24</sup> As osteoporosis develops, the bones lose calcium, become softer, more porous, and brittle, and are more susceptible to fractures. It can cause a hip or wrist fracture from a simple fall and decreases life expectancy about 12 percent, because hip fracture is the leading cause of death in people aged seventy-five and over.<sup>25</sup> As osteoporosis develops in only some postmenopausal women, decreased estrogen levels are only a partial explanation for this disease. Vegetarians were found to have a lower than average risk of osteoporosis, and two studies in the 1970s began to clarify why this was so. They found that the body loses net calcium on high-protein diets, no matter how much calcium is consumed. High-protein diets apparently cause the body to “borrow” calcium from the bones as a buffering agent.<sup>26</sup> Meat that is high in phosphorus (such as beef, other red meats, and processed meat products) is additionally undesirable because high phosphorus foods inhibit the absorption of calcium into the bloodstream. Therefore, beef is contraindicated because it is high in both protein and phosphorus.

The economic burden of osteoporosis is enormous even beyond the \$1 billion it is calculated to cost Americans annually. Each year, approximately 200,000 women suffer fractures that are directly attributed to the disease, and 40,000 of this number die of fracture complications.<sup>27</sup>

Now we turn our attention to certain of the foodborne diseases, such as salmonellosis, *E. coli*, campylobacter, listeria, brucellosis, and tuberculosis. Our discussion will focus almost entirely on salmonellosis, however, as it is a major current public-health problem and amply demonstrates the controversy raging today about the routine use of antibiotics in animal feedstuffs.

Salmonella is a bacterial organism commonly found in beef, poultry, and other contaminated animal products. Salmonellosis is the disease or food poisoning caused by the organism and is, at best, a miserable nuisance to experience. Symptoms include nausea, diarrhea, abdominal cramps, fever, headache, and sometimes vomiting and chills. For the elderly, the ill, and babies, however, or for anyone whose immune system is

deficient, salmonellosis is far more serious, as the disease can be fatal (approximately five hundred deaths annually).

The incidence of salmonellosis has dramatically increased in recent years. The increase is not just due to better reporting.\* The human population is being infected from animal sources, with a high degree of association with raw meat and poultry. Meat often becomes infected during the slaughter and processing procedures, even when the animals arrive “clean” from the farm or feedlot. Ironically, more “healthful” food-processing procedures that use less acid, salt, and nitrites, receive little or no cooking, and are subject to irregular heating in microwave ovens also contribute to the problem.<sup>28</sup>

The Centers for Disease Control (CDC) estimate that for every case of Salmonella poisoning actually reported—42,028 cases in 1986—another 50 to 100 cases go unreported and are often thought to be bad cases of influenza. CDC’s official estimate is that 2 to 4 million cases of Salmonella poisoning occur annually, which is considered a conservative figure.<sup>29</sup> The National Research Council (NRC) of the National Academy of Sciences (NAS) has stated that “salmonellosis is one of the most important communicable disease problems in the U.S. today.”<sup>30</sup> The financial costs are estimated to be well in excess of \$50 million annually.<sup>31</sup> Indirect costs may equal or even double these direct patient-related costs.

In 1987, the National Veterinary Services Laboratory (NVSL), the national repository for animal Salmonella statistics, reported that 9,030 Salmonella isolates were cultured in 1987, of which 1,457 came from beef alone.<sup>32</sup> Poultry and egg isolates are even higher. As in human Salmonella cases, the percentage of laboratory isolates represents only a fraction of the actual number of field infections in both livestock and poultry. On a percentage basis, the portion of the \$50 million Salmonella bill caused by beef isolates totals at least \$8 million annually.

Although salmonellosis is not a new disease, the high visibility and notoriety that it receives today are due to the emergence of so many antibiotic-resistant strains of Salmonella, caused by the routine feeding of low levels of antibiotics to livestock and poultry. In fact, half of the 35 million pounds of antibiotics produced in the United States are fed to livestock rather than used to treat human illness. Accord-

\* Contaminated feed ingredients are a major source of Salmonella and other bacterial infections in farm animals. (FDA Veterinarian, Vol. III, No. 4, Nov./Dec. 1988, p. 12). This is because the remains and condemned parts of farm animals are rendered down at temperatures too low to kill such bacteria and then fed back to farm animals.

ing to *Science* magazine: “...A majority of scientists agree that the use of subtherapeutic doses of antibiotics in animal feed—principally penicillin and tetracycline—has already weakened their value in human disease.” Antibiotics in animal feed kill off vulnerable bacteria, leaving the more competitive and, often, more virulent microbes to flourish. When these bacteria are then passed through a contaminated food source, such as meat, eggs, and raw milk, and consumed by people, illness can be prolonged (or become fatal) because conventional antibiotic therapy is ineffective against these drug-resistant organisms. Scientists are also worried because the genetic material controlling drug resistance can be transferred from bacteria to bacteria (via R plasmids on the genes). Thus, every person or animal taking an antibiotic (therapeutically or subtherapeutically) potentially becomes a factory producing resistant strains.<sup>33</sup> Twenty to 30 percent of all Salmonella isolated in humans is now resistant to antibiotics.

Although most American poultry farmers have now either switched to using antibiotics developed only for animals or have stopped using them altogether, a 1979 Office of Technology Assessment (OTA) study estimated that 70 percent of beef cattle are still being reared on feed mixed with tetracycline or penicillin.<sup>34</sup> Additionally, in recent years, culled dairy cows have become a major source of lean hamburger. Unlike steers raised specifically for slaughter as beef, dairy cows are often culled and sent to slaughter when they become sick. As these cows have typically, though unsuccessfully, been given antibiotic treatment before being culled, these animals can be perfect hosts for resistant Salmonella strains. Meat eaters who are on antibiotic therapy are prudently advised to order their meat well done, especially the leaner cuts, as a means to ensure that any Salmonella invaders are killed during the cooking process.

Ten years after the Food and Drug Administration (FDA) first proposed a ban on penicillin and tetracycline in animal feed, little has happened, because Congress chose to believe the meat industry’s claim that a direct and clear link had not been demonstrated between the antibiotics in livestock feeds and human illness. Although previous studies had offered strong evidence that a direct association existed, researchers were thwarted in pinpointing the entire pathway between the animals and outbreaks of disease in humans (Connecticut, 1976: veal calves identified as the source of a Salmonella outbreak; Pennsylvania/New Jersey, 1981: roast beef identified as the source of two Salmonella outbreaks).<sup>35</sup> More recently, with smart epidemiological sleuthing and technological ad-

vances that can study genetic transfer between species, it has been possible to supply the last missing link between the animals fed antibiotics and outbreaks of human disease (Minnesota, 1983: hamburger from a South Dakota beef herd identified as the source of a six-state Salmonella outbreak; California, 1985: hamburger from dairy farms was identified as the source of a Salmonella outbreak).<sup>36</sup> These findings have now led a majority of leading scientists to believe that sub-therapeutic levels of antibiotics mixed with animal feed are, in the long term, very detrimental to human health and should be banned for use as growth promoters.

Brucellosis and tuberculosis (TB) are two other communicable diseases that can be passed from animals to humans (zoonoses) while being routed through our food-processing systems. Although both were once prevalent in the United States, their current incidence rate is very small. Figures from 1987 showed a .14 percent cattle reactor rate for brucellosis, with only 106 human cases reported to the CDC, and a .03 percent reactor rate for TB, with no human cases reported from bovine sources.<sup>37</sup> Although we would not advocate the discontinuation of these two programs, their existence is an additional hidden cost of beef. These two disease eradication programs combined cost the taxpayers \$64 million in 1987 (brucellosis, \$60 million; TB, \$4 million).

Meat presents us with other potential food hazards beyond those of infectious diseases. Today's intensively produced livestock are exposed to vast quantities of toxic chemicals and artificial hormones. Residues are then transmitted to people who eat meat or dairy products from these contaminated animals. Few of these chemicals even existed before World War II, and we do not yet know the long-term health consequences of eating these animal products, which can contain residues from hormones, growth stimulants, insecticides, tranquilizers, herbicides, antibiotics, and larvacides. It is only within the last few years that we've begun to discover that the chemicals that have made it possible to increase our food supply and produce meat "cheaply" also have some unanticipated risks and harmful consequences. As an example, DES, a synthetic estrogen, was prescribed for three to six million pregnant women between 1941 and 1971 to prevent miscarriages before it was discovered to be carcinogenic. It was implanted in millions of cattle as a growth promoter until 1979, when it was finally banned—over the vigorous objections of the meat industry. Yet, several years after this ban went into effect, one-half million cattle were found to have been illegally implanted with DES.<sup>38</sup>

The variety of potentially toxic drugs and chemicals is very broad. There are implanted growth promoters in cattle like Ralgro and Synovex; there are sulfa drugs, such as sulfamethazine, fed to swine and cattle to prevent disease, that have recently been shown to cause cancer in lab animals; there are pesticides, such as dieldrin, which, although now banned, was used on livestock feed crops for many years and still remains concentrated in our body fat; and there are PCBs, PBBs, and other toxic chemicals that contaminate the ground on which livestock animals graze, which have led to discernible levels found in even the breast milk of nursing mothers. Industrial and other environmental pollutants have contaminated livestock, as well, with heavy-metal residues, such as lead found in bone meal and cadmium levels found in livers. A 1979 study by the General Accounting Office (GAO) indicates that 14 percent of dressed meat and poultry sold in supermarkets have illegal residues of drugs, pesticides, and other contaminants. Of 143 drugs and pesticides likely to produce residues in raw meat and poultry, the report says that 42 are suspected of causing cancer, 20 of causing birth defects, and 6 of causing mutations.<sup>39</sup>

Foods of animal origin are a major source of pesticide residues in the diet. Recent estimates indicate that, of all the toxic residues in the American diet, 95 to 99 percent come from meat, fish, dairy products, and eggs.<sup>63</sup> A cow (or other animal) will retain in its fat tissue all the pesticides it has ever consumed. With each step up the food chain, animals—including humans—become ever more concentrated carriers of the toxins from all the foods they ever ate.

Pesticide analyst Lewis Regenstein has written: "Meat contains approximately 14 times more pesticides than do plant foods; dairy products 5.5 times more. Thus, by eating foods of animal origin, one ingests greatly concentrated amounts of hazardous chemicals."<sup>64</sup>

About 1 billion pounds of pesticides are used annually in the United States in an effort to control crop pests. Of these, 51 percent are herbicides, 35 percent insecticides, and 14 percent fungicides. Sixty-one percent of all herbicides used in the United States are applied to corn and soybeans, which are primarily raised as livestock feeds.<sup>65</sup> Still, with all the pesticides that we employ, 33 percent of our potential crop production is destroyed by insects, pathogens, and weeds.

When we say pesticides, we are speaking of such chemicals as DDT, heptachlor, dieldrin, dioxin (even hexachlorophene contains minute quantities of dioxin), PBB, and PCB—and there are many more. Some estimates are that as many as

five hundred to six hundred toxic substances can be found in our food supply. Again, Mr. Regenstein writes:

*Despite the overwhelming evidence that pesticides cause cancer and are extremely dangerous to humans and the environment, almost none of these chemicals have ever been banned by the government in the true sense of the word. In the very few cases where pesticides have been the subject of suspensions...the results have usually been restrictions or bans placed on some or most uses while other applications have been allowed to continue.*<sup>66</sup>

Even when the use of a pesticide has been banned or restricted, as DDT and dieldrin have been, the poison does not simply disappear from the environment. Some toxic chemicals, such as DDT, take decades, or centuries, to degrade. Even if we stopped all pesticide use today, our environment and food chains would be contaminated for years to come. Since beef and other meat products contain concentrated amounts of toxic residues in their fatty tissues, eating foods lower on the food chain (i.e., foods of plant origin) will make our food supply safer. Since pesticides are known to compromise our immune system, many scientists feel that the presence of toxic chemicals in our bodies is largely responsible for the emergence and spread of immune system diseases that weren't problems years ago—diseases such as cancer, AIDS, and herpes. In today's world, anything we can do to strengthen our immune system is very important.

The estimated direct environmental costs for pesticide use in the United States annually are calculated at a whopping \$839 million, which does not include any of the indirect costs, such as chronic health problems, losses of wildlife and microflora, accidental releases of pesticides, etc.<sup>67</sup>

The Food Marketing Institute reported in the September 1987 issue of the *National Hog Farmer* trade journal that 76 percent of consumers polled perceive chemical residues as a serious food hazard, and 61 percent were also worried about antibiotics and growth hormones. Can the USDA's meat and poultry inspection program, administered by the Food Safety and Inspection Service (FSIS), really protect the consumer from contaminated and "unwholesome" meat? Is our meat safe to eat? Carol Tucker Foreman, who was assistant secretary of agriculture for food and consumer services in the Carter administration, gives an honest answer by stating that:

*The problem of detecting chemical (or bacterial) contamination starts with one very frustrating fact—you*

*can't see it.... Furthermore, the tests we have to do to find these residues are extremely expensive, technologically very sophisticated, and require a long time to perform. You can't do them on every single animal.... That means the USDA must rely on statistical sampling, choosing a small group of animals at random on which to conduct the tests. Then it must hope it sampled a sufficient number of animals to catch any harmful residues. Even so, the process is time-consuming and inefficient and there is no way the USDA can test for every single chemical that could contaminate meat.... The meat inspection laws never contemplated that there would be a problem you couldn't recognize [grossly].*<sup>40</sup>

This statement is borne out by FSIS statistics that show that, of nearly 35 million cattle slaughtered in 1986, only 8,277 were tested for chemical residues by the FSIS monitoring and surveillance programs—which means that only .02 percent of the cattle slaughtered were actually checked for residues.<sup>41</sup> What the "USDA Inspected" stamp on our meat actually means is that each carcass received a brief visual examination—and little more—by an FSIS inspector who may be looking at up to 300 cattle per hour.<sup>42</sup> With a total FSIS budget of more than \$392 million for 1988, consumers may well feel that this is a poor return from their tax dollars for quality assurance.<sup>43</sup>

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## HIDDEN ENVIRONMENTAL COSTS

We turn now to environmental costs, which are also part of the hidden costs of beef. It is said that the majority of environmental problems in the world today are related either directly or indirectly to meat consumption. While livestock agriculture requires a vastly greater investment of natural resources than plant-food agriculture, the nutritional return is the same or less. Land, water, and energy requirements for livestock agriculture are estimated to be ten to one hundred times higher than those necessary to produce an equivalent amount of plant food.<sup>44</sup> And, importantly, livestock agriculture doesn't just use resources—it depletes them. Most of the world's soil erosion, groundwater depletion, and deforestation problems—which so threaten adequate sustainable food production today and contribute to desertification and the global Greenhouse Effect—are the result of this inefficient and destructive form of food production. As Denzel



and Nancy Ferguson, authors of *Sacred Cows at the Public Trough*, have written: “Seldom in history have so many been so thoroughly brainwashed by so few. The truth of the matter is: No industry or human activity on earth has destroyed or altered more of nature than the livestock industry.”<sup>45</sup> The United States and a few other privileged countries can enjoy a diet high in meat year after year only because we have such extraordinarily rich natural resources and a technologically advanced industry. The rest of the world simply does not have the ecological resources to support an American-style diet—which may be a hidden blessing. Our ecological and environmental blinders must come off quickly, however, as even the United States will not be able to continue its same diet indefinitely—not if we wish to avoid the mass depletion of our natural resources and wildlife.

Livestock agriculture dwarfs all other land use in the United States. Less than half the harvested agricultural acreage in the United States is used to grow food for people. Most of it is used to grow animal feed. We feed these animals more than 80 percent of the corn we grow and more than 95 percent of the oats. In the United States, 91 percent of the estimated 27.1 million metric tons of cereals, legumes, and vegetable protein that is suitable for humans is fed to livestock, to produce the 5.3 metric tons of animal protein that humans consume annually.<sup>46</sup> This is an extremely inefficient use of our acreage.

Feedlot beef protein production is especially inefficient, with a feed-efficiency conversion rate of only 6 percent, which means that 94 percent of the protein that we feed to these cattle is lost. We also lose 96 percent of the calories, 100 percent of the fiber, and 100 percent of the carbohydrates from feeding plant proteins to cattle. To put this another way, it takes sixteen pounds of grain and soybeans fed to beef cattle to produce one pound of meat on our plates. The other fifteen pounds are turned into manure (which has become a massive environmental problem causing air and water pollution). To supply food for one person with a meat habit for a year requires three and a quarter acres, vs. a mere half-acre for a lacto-ovo vegetarian.<sup>47</sup>

Our land itself is only 70 percent as productive as it once was, largely due to the overuse of chemical fertilizers. To quote the Nebraska Sustainable Agriculture Society (Sept. 1987): “In 1950 the world produced 624 million metric tons of grain with 14 million tons of fertilizer. This is a response ratio of 46. In other words, in 1950 every ton of fertilizer produced 46 tons of food. By 1980–86, the response ratio had dropped to 13. This is a drastic example of what is happening to soils

as a result of increased tillage and the use of salt fertilizers. What we call increasing production is simply the exploitation of nature’s reserve of carbon which has been stored up over many seasons’ growth and recycling.”

More than 5 billion tons of topsoil are eroded each year in the United States—almost all of it the result of livestock agriculture. According to the USDA, livestock grazing is outranked only by farming (which intentionally tears the soil) as a cause of soil loss and damage.<sup>48</sup> Two hundred years ago, most cropland in the United States had at least twenty-one inches of topsoil. Today, about one-third of the topsoil has been lost from U.S. agricultural lands, reducing its productivity and thus requiring additional fertilizer to offset the degradation.<sup>49</sup> In some areas, the average depth of topsoil is little more than six inches, and the rate of topsoil loss is actually accelerating. Most of this typical loss has been directly associated with livestock raising. Using beef cattle on the western ranges as an example, cattle strip the vegetative cover by eating most of the forage (grass) and also a considerable amount of browse (leaves from shrubs and trees). Perhaps even more destructive is the trampling that comes with the search for food. The cloven hoofs of cattle are repeatedly pounding the soil and vegetation with a pressure of twenty-four pounds per square inch. Combined with overgrazing, trampling has caused severe compaction damage and degradation to the soil and the western landscapes. When the soil is no longer held together by organic matter, loose soil particles are carried away by water or blown away by the wind, leaving an eroded and desertified land behind. The western rangelands today produce less than one-half the biomass they did before being damaged by the grazing industry.<sup>50</sup> The soil erosion bill is calculated to cost us in excess of \$6 billion a year.<sup>51</sup>

In trying to replace the lost productivity from soil erosion, we are creating another catastrophe: the destruction of our forests. Most of the vast expanse of pasture and feed crops that has replaced forest land is used to raise beef cattle. The United States has converted approximately 260 million acres of forest into land now needed to support our meat habits. Since 1962, the rate of deforestation has been one acre every five seconds. Researchers have said: “More than three times as much meat is derived from formerly forested..land as is derived from range land. That ratio is climbing each year as erosion and soil degradation claim more and more of the nation’s range land and ever more forest land is connected to..land (for meat production).”<sup>52</sup> Our forests are a vital source of oxygen and serve also to moderate our climate and to pre-

vent floods and soil erosion caused by the rapid runoff of water. We need the forests to recycle and purify water through the transpiration and evaporation of leaves and to provide habitats for the wide variety of wildlife that lives there.

Few people recognize or understand the environmental problems associated with cattle grazing. In the eleven far western states, more than 9.5 million cattle are allowed to graze on about 323 million acres of public lands owned by the Federal Bureau of Land Management (BLM) and the Forest Service (FS). This grazing area is equivalent to 43 percent of the entire land area of these eleven states. Yet we derive only about 3 percent of our beef supply from these rangelands (about two pounds of beef per capita per year). The thirty thousand ranchers who own these animals pay an absurdly low price of \$1.54 per head per month for this grazing privilege—which is only 10 to 20 percent of what the market value is for privately leased land. Some cattlemen benefit even more by subleasing their grazing rights for more than they pay the federal government. The U.S. Treasury grossed about \$9.2 million from these livestock fees in 1985, while spending at least \$100 million in directly related program costs and another estimated \$390 million in such indirect costs as predator control, fire management, soil erosion, low property taxes, and road maintenance.<sup>53</sup> The conservative net loss to the American taxpayer for this “welfare ranching” is \$390 to \$480 million dollars.

From an environmental perspective, this western grazing subsidy has been nothing short of a disaster. These cattle (and sheep) graze not only the grasslands, but on deserts, forests, wetlands, military reservations, wildlife refuges, even some national parks—almost any place with enough forage to keep a cow alive. Overgrazing, which is rampant, has helped to create a state of desertification in about 10 percent of the land in the American West.<sup>54</sup> With a depleted vegetative cover, native animals from insects to birds to large mammals have less to eat, less cover, less shelter, and fewer places to mate and nest. Additionally, water tables have dropped, thousands of creeks and springs have gone completely dry, and many streams and rivers have a much reduced flow. Millions of wild horses and thousands of wild burros have been killed over the years by public-lands ranchers and government agencies. So-called necessary predator-control practices on these federal lands, carried out by wildlife biologists with Animal Damage Control (ADC), an agency within the USDA, have killed 2.8 million coyotes, 477,000 bobcats and lynx, 7,255 mountain lions, about 24,000 bears, 50,000 red and gray wolves, and

approximately 7,000 cougars in a thirty-four-year period.<sup>55</sup> The ADC/USDA budget for its predator-control programs totaled \$24.4 million for 1988.

Much of our U.S. cropland, including some of our most productive land on the high plains, depends on irrigation. While fresh water shortages and falling water tables have been a fact of life for many years in the American West, the threat of groundwater depletion from irrigation has now become acute in many other parts of the United States, as well. The underlying cause of the West's water shortage is the excessive use of water to produce livestock—chiefly the use of irrigation to grow feed and fodder. In the West, surface water for irrigation ranges from \$10 to \$15 per million liters, whereas groundwater costs between \$30 to \$60 per million liters to pump from the ground.<sup>56</sup> Irrigation also requires enormous amounts of fossil energy to run the pumps. Producing a pound of beef, including the water required to grow the forage and the amount drunk by the animal, takes twenty-five times more water than producing a pound of bread. A hamburger for lunch and an eight-ounce steak for dinner require an investment of 3,910 gallons of water.<sup>57</sup>

Half of the United States' grain-fed beef is produced in the plains states of Kansas, Nebraska, Oklahoma, Colorado, and New Mexico. The enormous amount of water needed for these animals comes primarily from a single groundwater source—the Ogallala Aquifer. This aquifer has two distinctions: one of being the largest discrete aquifer in the world (the trapped runoff of several ice ages), the other of being the fastest disappearing aquifer in the world.<sup>58</sup> Although as recently as fifty years ago the Ogallala Aquifer had remained hardly touched by the amount of water pumped out of it, with the advent of factory farming and feedlot beef the amount of water depletion from this aquifer has dramatically risen. At the present time, more than 13 trillion gallons are taken from the Ogallala, and the vast majority of that water is used to produce meat, primarily beef. This is more water than is used to grow all the fruits and vegetables in the United States. While everyone seems to agree that the Ogallala will begin to give out relatively soon, the pressing question is when. Some estimates predict that the Ogallala may be dry within thirty-five years.

Special pollution problems result from irrigated agriculture when river and stream water are degraded by the leaching of salts from irrigated land. At times during the summer, the Red River in Texas and Oklahoma is more saline than seawater, due mainly to irrigation use coupled with normal evaporation.<sup>59</sup>

Additional enormous quantities of water must also be used to dilute and wash away vast quantities of animal manure, and pollution of our water resources has compounded our water shortage problems. Livestock can pollute water supplies in two ways: through livestock wastes and through slaughterhouse wastes. By far the greater cause of water pollution is livestock wastes, which have infiltrated our rivers, lakes, and streams.

Fifty years ago, most livestock manure was returned to enrich the soil. But today, with huge numbers of animals concentrated in feedlots and confinement housing, there is no economically feasible way to return these wastes to the soil. Chemical fertilizers are cheaper, cleaner, and easier to transport. One beef cow produces as much waste as sixteen humans. The largest feedlots, with up to one hundred thousand cattle, have a problem equivalent to that of our largest cities. Animal waste is high in nitrogen, which is what makes it such a good fertilizer. But, unreturned to the soil, much of it converts to ammonia and nitrates. The dumping of livestock wastes into the water supply causes dangerously high nitrate levels in rural wells. Toxic nitrates are also beginning to show up in municipal water supplies. Astoundingly, the USDA used to encourage beef producers to locate feedlots on hillsides near streams to channel manure more easily into the water.<sup>60</sup> The USDA no longer does this, but many of our rivers, lakes, and streams can now hardly support fish or other aquatic life because of this pollution damage. Water pollution is estimated to cost more than \$20 billion per year.<sup>61</sup> The cost of water subsidies to livestock producers on an annual basis is not available but is estimated to cost \$24 billion in California alone.<sup>62</sup>

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## HIDDEN ANIMAL-WELFARE COSTS

**W**e have now examined both the health and environmental factors involved in the hidden costs of beef. But what of the animal-welfare costs to the animals themselves?

While not intensively confined for their entire lives, as are factory farmed animals, range cattle experience harsh living conditions and abbreviated lives. Once cattle are turned out onto the ranges in the spring or summer, they must fend for themselves. Because most western rangelands are overgrazed, range livestock have to cope with many of the same problems as wild animals do. Many die of starvation, especially in times of severe weather conditions or drought, which deplete already marginal ranges. Along with the natural hardships, range cat-

tle also suffer at the hands of their owners from institutionalized and accepted forms of inhumane treatment, such as branding, dehorning, and castrating. Because these cattle are essentially free-ranging animals and not accustomed to being restrained or handled, stress and injury can easily occur when they are roughly or improperly handled.

The management practices of branding, dehorning, and castration, procedures that have seldom been questioned in the past in terms of humaneness, are being considerably more scrutinized today to see: (1) are they necessary? and (2) are there alternatives? All cause considerable stress to the animal, although the younger the animal the less stress it probably experiences when being manipulated by these procedures. Hot iron branding, which has been the traditional method of identifying animals for many years, is now beginning to be replaced by more humane methods of identification, such as freeze branding, marking with indelible paint, ear tagging, and electronic identification. Although dehorning and castration will decrease the possibility of aggression-motivated injury, neither procedure has any immediate benefit to the animal and they are done mainly to increase production and efficiency. If dehorning and castration are performed, these procedures should be done within the first month after birth or as soon as possible thereafter, using a local anesthetic. In no case should these procedures be done just prior to transporting the animals to feedlots—which typically is a journey by truck of at least three hundred miles. Electrocautery of the horn buds in conjunction with a local anesthetic is probably the best dehorning method. Surgical removal of the testicles under anesthesia is preferable to injecting a sclerosing agent into the testicles or to crushing the spermatic cord with an emasculator or rubber ring.

The important question to pursue, however, is whether dehorning and castration need to be performed as routine husbandry practices, and the answer is probably not. Castration of beef calves should not be necessary because the faster growing beef breeds we now have reach market weight before they are sexually mature. In terms of reducing grain consumption and preserving ecological resources, it would be preferable to market these animals at an earlier age and weight of seven hundred to eight hundred pounds instead of one thousand pounds, anyway. It is nonsensical, too, to castrate bull calves and remove the natural growth-promoting effects of the testosterone produced in the testicles and then to turn around and implant these animals with artificial anabolic steroids to produce the same growth-promoting effects. Leaving the male

calves intact is more sensible and economical. Although animal scientists say that genetically polled breeds of cattle could be developed in one or two generations with careful selective breeding, many cattlemen believe that cattle “should” have horns and there has been little impetus to select for polled animals within breeds such as the Angus. On both these issues, the beef industry resists changing its breeding, management, and marketing practices, and the animals suffer as a result.

Generally, beef animals are raised on pasture in cow/calf operations, weaned at ten to twelve months, when they weigh six to eight hundred pounds, and transported to a feedlot to be “finished” on a high-concentrate diet until they reach one thousand to eleven hundred pounds—a process which takes approximately six months. The animals thus spend their lives under two markedly different husbandry and feeding conditions. Feedlots range in size and may stock a few hundred cattle or as many as one hundred thousand animals. The bulk of feedlots are located in the high-grain-producing states of Iowa, Nebraska, and Kansas. To achieve better economic savings, many larger feedlots have become vertically integrated with grain elevator companies, feed manufacturers, and meatpacking firms. The income tax laws have served to spur the growth of commercial feedlots, too, as outside investors have found a very popular tax write-off in feeder cattle, which promises a guaranteed market and a short turnaround for their money.

When a shipment of cattle arrives at a feedlot, they are stressed from the journey, the lack of food, water, and rest, and the unfamiliar animals and surroundings around them. Moreover, their diet drastically changes, too, and this adds to their stress. After grazing on a semiarid range with nothing but forages (which may often be low quality), they are shifted immediately to large quantities of high-energy concentrates with very little hay or other coarse fodder. The rapidly fermentable carbohydrates cause severe digestive upsets in some animals. Diarrhea, enterotoxemia, and abdominal bloat often result, as well as other problems such as liver abscesses, renal necrosis, urolithiasis, and laminitis.<sup>68</sup> These dietary changes—moving from a low-protein, high-forage diet to one with low roughage and high protein and energy quotients—need to be introduced more slowly. This is usually not done, however, because of the time squeeze involved in getting the cattle in and out within the norm of a 150/180 feeding schedule. The animals suffer the consequences as the result.

While overcrowding may be a problem in some feedlots, the major welfare issues are the lack of shade and shelter, bedding, and dry elevated areas where cattle can rest. Without

shade and shelter, cattle are exposed to weather extremes: freezing mud and snow in the winter (which can get severe enough to cause high mortality) and high humidity and hot sun in the summer. Few feedlots are sloped to provide adequate drainage. In the winter, cattle have no dry area in which to lie down and are forced to stand in freezing mud and manure. Cattle enjoy and benefit from mounds of earth or an elevated manure pack on which to lie. Cattle will tend to lie down more when it is cold if they have a suitable, dry area, and this is beneficial in terms of productivity as well as better welfare, since less body area is exposed to the cold air. This reduces the food energy expended by the animal to keep warm.<sup>69</sup>

In a USDA pilot disease-monitoring program called NAHMS (National Animal Health Monitoring System), preliminary statistics from data on fifty-six cow/calf operations and twelve feedlots in Iowa, California, and Georgia show that while disease conditions were similar from one operation to another—respiratory conditions, dystocia, and parasitism were the major problems experienced—the economic impact and outcome of these diseases varied considerably. On some farms, serological evidence of various diseases were found but few clinical signs. Whether infectious disease conditions actually erupted into clinical disease symptoms and whether the disease outcome was favorable or not depended a great deal on the management and environmental factors present. If husbandry and management were of a high caliber, animal stress was kept to a minimum and, although the animals might be exposed to disease organisms, they were less apt to become clinically ill or die.<sup>70</sup> Although every good husbandryman or animal welfarist already “knew” this fact to be true, we are now beginning to collect scientific data which verifies it. It is good to keep in mind.

When beef animals have reached market weight of approximately eleven hundred pounds, they are transported from the feedlot on their final journey to the slaughterhouse. The transportation process for livestock has long been a major animal-welfare issue and continues to be so. Temple Grandin, well-known livestock consultant, said in 1981 at a Livestock Conservation Institute (LCI) meeting that “in my opinion one of the greatest animal-welfare problems is the physical abuse of livestock during transportation.... Typical abuses I have witnessed with alarming frequency are: hitting, beating, use of badly maintained trucks, jabbing of sharp objects into animals, and deliberate cruelty.”<sup>71</sup> In a recent communication with her, she said she believes that the situation remains

the same in 1988 and estimates that bruising of cattle from improper handling costs the livestock industry approximately \$22 million per year. Animal handling experts such as Ms. Grandin have researched and published a great deal of valuable information and pragmatic ideas for the livestock transportation and meat industry that demonstrate more humane methods of handling and transporting cattle based on an understanding of ruminant behavior. The livestock industry cannot claim ignorance of humane handling principles or that necessary expertise is unavailable, yet the motivation to incorporate humane handling procedures into daily livestock operations remains elusive. Its lack is a disgrace to this industry. The animal suffering and deaths that constitute transportation losses and bruise statistics become of interest to the livestock industry only when they exceed a certain acceptable percentage. That some animals suffer injuries of every imaginable kind, sicknesses, and often death is seen merely as a cost of "doing business."

The right to a humane death ought to be the birthright of every animal under the care and control of human beings. The Federal Humane Slaughter Act of 1958 and 1978, which was vigorously opposed by the cattle industry, has helped to ensure that this is true for cattle and other livestock, but it is still not a reality for many animals. That law states that animals must be stunned before slaughter, but exempts kosher and other religious slaughter. The inhumanity of kosher slaughter is not the slashing of the carotid arteries but the hanging of conscious steers by a hind leg as they wait to be killed.

Many of the worst preslaughter abuses have been corrected, but the treatment of "downer" cows is still often wretched. Seriously sick and wounded cattle should be euthanatized at the farm, feedlot, or auction market rather than be subjected to further pain and stress upon being loaded into trucks for transport to slaughter. Similarly, cattle that arrive at slaughter as downers should be stunned on the truck rather than be forcibly and cruelly dragged onto the killing floor. Even for healthy animals, competent stunning is certainly not always a reality because of human disinterest and equipment failure and disrepair.

High corticosterol and catecholamine hormone levels found just before and after slaughter indicate that we need to pay more attention to the general stress levels that livestock experience as they are transported and slaughtered. Since stress before slaughter can affect the quality of the meat, there are economic as well as humane reasons for keeping stress at a minimum.<sup>72</sup>

## CONCLUSION

In conclusion, this paper has attempted to examine some of the major health, environmental, and animal-welfare costs associated with beef production in the United States. While we can calculate a monetary value for some of these costs, other costs cannot be delineated because the necessary data have not yet been collected. Costs such as the loss of human health, the pain and suffering to cattle and other farm animals, and wildlife extinction and loss of habitat cannot carry a price tag, as these costs are incalculable.

Additional relevant cost figures that have not been previously included in this paper include the \$28.3 million spent in 1987 by the USDA's Agricultural Research Service (ARS) on beef-related research (including production, reproduction, nutritional, disease, and meat-processing research studies). Nor does it include another \$22.2 million spent in 1987 by the USDA's Cooperative State Research Service (CSRS) on beef-related research in the form of grants given to state and land-grant universities.<sup>73</sup> Other USDA agencies, such as the Agricultural Marketing Service (AMS), Foreign Agricultural Service (FAS), Packers and Stockyards Administration (PSA), and the Economic Research Service (ERS) are involved to some degree as well with beef production, as they provide forecasting and marketing statistics on beef supplies for both domestic and international trading. There are also public-policy factors such as favorable tax policies, commodity support programs, and federal- and state-sponsored irrigation and water subsidies projects that benefit the beef and other livestock industries, but one finds it difficult if not impossible to get accurate figures about these special-interest programs.

The hidden costs of beef are not likely to be enumerated by the National Cattlemen's Association, the American Meat Institute, or other meat-industry organizations that want to keep the consumer image of beef as far removed from the animal and its environment as possible. They believe that the presentation of meat should appear as civilized and sterile as possible—and distant from the "blood and guts" of the animals from which it originated. The meat industry has generally succeeded in creating a favorable consumer image. Beef is regarded as high-status meat, akin to the fashionable status of fur coats and Cadillacs. It is also culturally linked with virility and quality nutrition, although in reality it is a nonessential dietary luxury.

While beef producers, with missionary zeal, would have us believe that their industry will help feed the world, the facts

here, too, need to be set straight. Instead of providing red meat for a hungry world, the United States is the world's largest importer of beef! In 1986, we imported 1.4 billion pounds of beef from such countries as Australia, New Zealand, Canada, and Costa Rica (which doesn't have enough meat for its own consumption, yet sells it to us). We're also one of the world's biggest exporters of meat to such countries as Japan (239 million pounds) and Brazil (90 million pounds) (1986 figures).<sup>74</sup> This beef does not go to any of the world's poor or needy, but commands a premium price on the world market for the affluent who can afford it.

As John Robbins in *Diet for a New America* wrote:

*At the present time, when most of us sit down to eat, we aren't aware of how our food choices affect the world. We don't realize that in every Big Mac there is a piece of the tropical rain forests, and with every billion burgers sold another hundred species become extinct. We don't realize that in the sizzle of our steaks there is the suffering of animals, the mining of our topsoil, the slashing of our forests, the farming of our economy, and the eroding of our health. We don't see in the sizzle the cry of the hungry millions who might otherwise be fed. We don't see the toxic poisons accumulating in the food chains, poisoning our children and our earth for generations to come. But once we become aware of our food choices we can never really forget.... The earth itself will remind us, as will our children, and the animals and forests and the sky and the rivers, that we are part of this earth and it is part of us....*<sup>75</sup>

We have summarized below the health, environmental, and animal-welfare costs associated with our cultural addiction to beef that are currently known and available and detailed throughout this paper. The costs are listed on an annual basis unless otherwise specified.

atherosclerosis . . . . .	\$37 billion
colon, breast, and prostate cancer . . . . .	\$28 billion
osteoporosis . . . . .	\$1 billion
salmonella . . . . .	\$8 million
brucellosis . . . . .	\$64 million
tuberculosis . . . . .	\$4 million
federal meat inspection program (FSIS, USDA) . . . . .	\$392 million
soil erosion . . . . .	\$6 billion

western grazing lands (direct and indirect costs) . . . . .	\$480 million
water pollution . . . . .	\$20 billion
pesticide pollution . . . . .	\$839 million
transportation injuries . . . . .	\$22 million
federal beef research funding through ARS and CSRS, USDA . . . . .	\$50.5 million
total costs . . . . .	\$93.86 billion/year

The meaning of the figures outlined above is that the U.S. livestock industry conservatively costs Americans almost \$94 billion per year in hidden health, environmental, and animal-welfare costs, a sum most consumers are not aware of spending when they buy meat at the supermarket. Such a price tag is food for thought.

Using 1987 USDA figures, we find that the per capita beef consumption of 73.4 pounds per year is 33 percent of the total 221.7 pounds of meat and poultry eaten in the United States. If we divide the \$93.86 billion hidden-costs figure by one-third, to represent the percentage of beef consumption, we will price the hidden costs of beef alone to be at least \$31.3 billion per year. With the current U.S. population at 243 million people, we find that an additional \$1.75 must be added to the \$2.45 for the average retail price of a pound of beef. Thus, the real price of a pound of beef is nearly double the price that people think that they pay for their beef. Because so many hidden costs are still unavailable, other costs incalculable, and because the damage potential is so great, the full cost of beef cannot be completely known. The real significance of the hidden costs of beef, however, is much more than any dollar value. David Pimental brings this into a broader perspective for us when he writes:

*Already both energy and land resource limitations make it impossible to feed the present world population of 4 billion a U.S. diet (69 percent animal protein) that is based on U.S. technology. World diets will have to depend mainly on vegetable protein. Over 70 percent of the protein consumed by people outside the United States is of vegetable origin. Currently about two-thirds of the protein available to man comes from cereals (47 percent) and legumes (20 percent). These protein sources will become ever more important in the future.*<sup>76</sup>

What can we do as American consumers? First of all, we must realize that eating less meat is an ecological and



ethical imperative, and we can no longer reasonably claim ignorance of this fact. A reduction, at least, in our beef consumption habits will benefit ourselves, our environment, and the animals. We should seek out organic and natural beef sources. Alternatively raised animals are healthier as food sources, as they are not raised on antibiotics (and additives are not added to their meat); their feed is grown with little or no chemical pesticides and fertilizers; and the animals are raised under more humane conditions and with less stress. When we eat meat at meals, we should use it as a condiment, in small quantities, rather than it being the focal point around which the meal is developed. For other consumers, the choice is clear and the path of vegetarianism is chosen. The decision to change our eating habits is both personal and profound, but the time to begin is now.

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